drop, in the manner specified.——Mr. G. W. Putnam, of Moreau, New York, has patented an improved vice jaw for saw-filing machinery. What he claims as his invention is "the jaws of the vice shaped to correspond to the shape of the saw teeth, and support the same, so as to prevent vibration during the operation of filing, as herein set forth, whereby a better edge is given to the tooth, the wear of the file is diminished, and the process of sharpening expedited."——Mr. Sommers Crowell, of Reading, Pennsylvania, has patented an improvement in railings. What he claims as his invention is, "making the dovetailed tenons, whether to the paling or top and bottom rails, wedge shaped in the length of the railing; the taper at the opposite ends being reverse, and making the grooves in the rails or palings in the same manner, that the palings cannot slide in either direction, binding the whole firmly together, substantially in the manner described."——Mr. Albert Eames, of Springfield, Mass., has patented an improvement in machines for facing and polishing stone and other substances. What he claims as his invention is "the method substantially as described, of grinding, facing, or polishing the surface of stones and other substances, by means of a grinder, rubber, or polisher, connected and combined with a spindle, from which it derives a rotary motion by means of universal and sliding joints, substantially as described, that the said grinder, rubber, or polisher, may be carried over any and all parts of the surface to be worked, whilst its surface is self-adapting as described."

Steam-engine Improvements.—Mr. Beach, editor of the *Sun*, says that during his visit to England he has frequently seen notices in the English papers of great improvements made in the *Atlantic's* engines at Liverpool; but that on examination he finds that "not one solitary alteration has been made: the new pillar blocks and shaft were made of increased size and strength—nothing more." Moreover, he adds, that Mr. Rogers, the chief engineer, "one of the very best engineers that America can boast of," informs him that of three very important improvements made by Americans in the bracing and arrangement of engines, since their attention was first directed specially to ocean navigation some ten years since, "in building the last *fast* boats (the *Asia* and *Africa*), the Cunard line adopted two of these American improvements, and in the extra fast boats now building they are to go the whole figure, and fashion the engines *entirely* after the most approved American models." He also adds that "one of the engineers of the Royal navy, after scrutinising closely the American engines, was so highly pleased with it as to say to Mr. Rogers, that it should be adopted for the next naval vessel built, if any exertions of his could effect that object."

Cast-iron Pipes.—The prices of cast-iron pipes for street use, says a writer in the *Journal of the Franklin Institute*, has become so much reduced in consequence of the low price of iron and improved method of manufacture, that a comparison between the prices of this year and those paid in 1820, may be interesting.

	Prices in 1820.	Prices in 1860.
22 inch pipe, per foot	£6 25	
20 " "	5 0	£2 75
16 " "	3 33½	2 [illegible]
10 " "	2 40	1 3
8 " "	1 66½	82
6 " "	1 10	62
4 " "	64	40
3 " "	45	26

BLACKWALL DOCKS.—The extensive dock formed by the East and West India Dock Junction Railway, at Blackwall, contiguous to the eastern entrance of the West India Docks, has been opened for the admittance of shipping. It covers a space of nearly 7 acres, and its depth of water amounts to upwards of 24 feet.

COMPETITION, MARKET DRAYTON.—The late competition for the new workhouse at Market Drayton has been decided in favour of Mr. Barry, of Liverpool. The plans have been sealed by the Poor-law Board and the work will be commenced immediately.

VENICE.

AN esteemed correspondent, an ardent lover of the beautiful, writing to us last week from Venice,—once the

——"Fairy-city of the heart,
Rising like water-columns from the sea,
Of joy the sojourn, and of wealth the mart,"

says, "Venice is the first place at which I have wished to stay longer than was necessary to see the lions. We have only made a slight acquaintance with some of its exterior features as yet: but *to be at Venice* is quite sufficient occupation: everything is new, and almost everything is beautiful. The windows of our sitting-room look across the grand canal: opposite to us is the Isola san Giorgio, and beyond us we can see the tall masts of vessels: close to our right is the Piazzetta of St. Mark, with that wonderful column, and its winged lion, which has been so prominent a feature in all the pictures one has ever seen, and in all one has dreamed of Venice, from childhood till now: close, of course, to the Piazzetta, is the Piazza of St. Mark, and there a very good military band has been playing this evening. I think the Campanile is my greatest wonder here; it is so much more gigantic than I anticipated. We just went into the cathedral this morning, but did not attempt to take more than a general idea of it: one of the mosaics caught our attention; it represented the building of a church (I suppose), and the workmen used, instead of ladders, inclined planes of wood, with strips nailed across for steps,—exactly the same as those they have here at the present day. The Italian scaffolds also amuse us: they are suspended from the roof of the house, instead of being supported from below: one we saw was different; it had the supporting beams on which the planks were laid, driven so far into the wall that it needed nothing else to secure it. The profusion of rich and precious marble everywhere, is one of the greatest wonders to us." Our friend's opinion of *Milan Cathedral* would satisfy Mr. Ruskin:—"The effect it produced on me," says the writer, "was a sensation of happiness, like what one experiences when in the midst of delicious flowers, beautiful music, or whatever else is most loveable."

A THEORY OF THE AURORA BOREALIS.*

THIS magnificent phenomenon is based upon the same simple laws of nature by which thunder-storms and water-spouts are produced, as explained in a recent number.†

The greatest exhaustion of nature takes place in the torrid zone, and diminishes gradually towards the poles; and in proportion to this exhaustion, the Omnipotent Ruler of the Universe has provided laws, ordinary and (to us) extraordinary, but always simple, to restore the balance, and keep up the equilibrium suited to His creatures on earth. Thus He supplies us, in His ordinary way, with a never-failing stream of cold water, and a never-failing current of fresh air, from the poles to the equator, where they are most wanted; and in the same manner He supplies us from the never-failing source of the poles with a constant current of positive electricity, taking its course above our atmosphere, likewise towards the equator.

My last communication has shown to your readers, that the greatest quantity of positive electricity exists in the upper regions of the poles, and they will perhaps have concluded, that the negative electricity exists also at the poles in its greatest accumulation, both fluids bearing generally the same proportion in their corresponding spheres of the earth. The accumulation of positive electricity at the poles is greatest from the intense cold and the rarety of the upper regions, and that of negative electricity arises from the earth being bound with snow and ice, and thus retaining it without any evaporation. The accumulation is greater also at the north than at the south pole, the former having more land and the latter more water, and the one possessing more electricity than the other. The evidence of this accumulation of these reservoirs of electricity, lies in their attraction of the magnetic needle; for, the greater the quantity of electric fluid, the greater the amount and force of its inherent magnetism: and the greatest power of attraction is in the northern hemisphere.

According to all accounts, the Aurora Borealis takes place after a thaw. By this means, then, and in proportion to the rapidity of the thaw, the immense quantity of negative electricity bound there in the earth, and accumulated moreover on its warmly-kept snow-covered surface, is liberated, and finds its way into the upper regions by creeping up the sides of the numerous hills and mountains of these places, or is carried up by the rising vapours. Whether these vapours will form a cloud of fog, rain, or snow will depend on the temperature of the air, and no doubt determine in what form and colour the amalgamation of the fluids is to take place. To me it seems more likely, from the nature of the aurora borealis, the cold state of the upper atmosphere and the general rapidity of the thaw, that the forming clouds carry up the electricity of the earth, instead of, as in the case of thunderstorms, their bringing the positive electricity down. If, without the assistance of any cloud, the hills and mountains serve as conductors, the effect will of course be different, and the aurora will be produced like the sheet lightning of our summer evenings, in which the presence of oxygen may have a share.

By these means, however, the aurora borealis takes place: it is the union of the positive and negative electricities in a different clime, and under different circumstances, and, no doubt, for different ends. Its sensible effect upon the magnetic needle, before it reaches the point of culmination, must be obvious, considering the disturbance caused by the quantity of the fluids brought into action from a state of rest.

Without practical observation and more extensive research, it is impossible for me to give particular reasons for all the changes of this phenomenon, as to shape, direction, colour, &c. The shape of an arch, however, may be accounted for by the atmosphere's forming a ring round the earth,* and the circumference of the earth being greatly narrowed towards the poles, the arch of the atmosphere at the poles must naturally be more contracted and lower in proportion than the arch which it forms nearer and round the equator; and the electricity of the upper regions floating on the air in the same way, will present to our view the aurora borealis in a curve or arch. It must also be remembered, that the atmosphere at the poles is not as high as towards the equator, from the narrowing circle of the earth, as well as from the density and heavy state of the air. Different streams of electricity from different mountains, the extent of the electric liberation, will cause different forms and sizes: the negative cloud will affect the condition, and, according to its direction, also the course of the aurora: the rotation of the earth round its own axis, as well as currents of the upper atmosphere, will influence its motions: and its colour and brilliancy will change according to its contact with atmospheric air, or the composition of the clouds that bear the negative fluid, whilst refraction and reflection form, no doubt, one of the most important considerations.

The presence of oxygen seems to me of the greatest moment as to the colour of this wonderful work of the Creator; and that there is, like water, air, and electricity, also a constant flow of pure oxygen in the upper regions from the poles to the equator, in immediate contact and regular fusion with our atmosphere, I have no manner of doubt; and this gas exists likewise in its greatest and densest quantity both in and above the air at the poles.

My reasons for this theory may appear in another number of your paper.

WM. ADOLPHS.

* The recent appearance of this phenomenon gives additional interest to this communication.

† See p. 502, *ante*.

* It appears that a complete ring of vapours or clouds girds the tropical region of the earth, and may even appear as a ring to other planets.

A NEW LIGHTHOUSE has lately been erected on the Island Lagosta, in Dalmatia, instead of the temporary one hitherto existing there.